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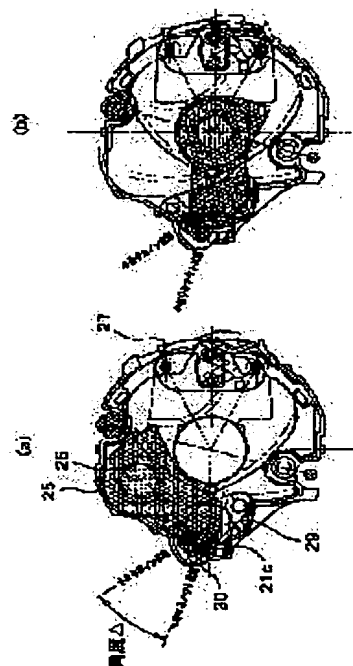
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(54) LIGHT QUANTITY ADJUSTING DEVICE, LENS BARREL AND PHOTOGRAPHING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To realize a light quantity adjusting device capable of performing consecutive light quantity adjustment and shutter operation, preventing the deterioration of optical performance with small limited light quantity and coping with both the photography of a moving picture and the photography of a still picture without increasing the number of parts and making the device larger.

SOLUTION: This light quantity adjusting device is provided with a light shielding member moving between an opened state and a closed state so as to perform at least either the consecutive light quantity adjustment or the shutter operation, a 1st actuator 27 driving the light shielding member, a light quantity limiting member 25 where an aperture having smaller area than opening area obtained in a state where the light shielding member is opened is formed, a 2nd actuator 29 driving the member 25, and a dimming filter 26 attached to at least either the member 25 or the light shielding member and covering over the aperture of the member 25.



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CLAIMS

[Claim(s)]

[Claim 1] A quantity of light adjustment characterized by providing the following A protection-from-light member which moves from an open condition before a closing condition, and performs at least one side among continuous quantity of light accommodation and shutter actuation The 1st actuator which drives this protection-from-light member A quantity of light limit member in which a opening of an area smaller than opening area in an open condition of said protection-from-light member was formed It is attached at least in one side among the 2nd actuator which drives this quantity of light limit member, and said protection-from-light member and said small quantity of light limit member, and is a wrap extinction filter about a opening of said quantity of light limit member.

[Claim 2] A quantity of light adjustment according to claim 1 characterized by having a detection means for detecting a migration condition of said protection-from-light member.

[Claim 3] A lens barrel characterized by having a quantity of light adjustment according to claim 1 or 2.

[Claim 4] A lens barrel according to claim 3 characterized by having a movable lens attachment component in the direction of an optical axis, and attaching said quantity of light adjustment in said lens attachment component.

[Claim 5] A lens barrel according to claim 4 characterized by having arranged said protection-from-light member and said small quantity of light limit member in the photographic subject side edge section in said lens attachment component, and having arranged said 1st actuator and said 2nd actuator to an image formation side side rather than said protection-from-light member and said small quantity of light limit member.

[Claim 6] A lens barrel according to claim 4 or 5 characterized by having a device for moving a lens in the direction of an optical axis, and having arranged said 1st actuator and said 2nd actuator in a range in which said migration device is not arranged in optical-axis directional vision.

[Claim 7] A lens barrel according to claim 5 or 6 characterized by having arranged said 1st actuator and said 2nd actuator on the outside for a tubed part in which a lens in said lens attachment component is attached.

[Claim 8] Photography equipment characterized by equipping either of claims 3-7 with a lens barrel of a publication.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the quantity of light adjustment arranged in the lens barrel used for photography equipments, such as a camera, a video camera, and a digital still camera.

[0002]

[Description of the Prior Art] The quantity of light adjustment for animations to which drawing can be continuously changed from an open condition to a close-by-pass-bulb-completely condition is used for animation photography cameras, such as a video camera. On the other hand, 2 position change of an open condition and a small drawing condition (for example, F8) can be performed to still picture photography cameras, such as a digital still camera, and the quantity of light adjustment for still pictures in which shutter actuation is also still more possible may be used for them.

[0003]

[Problem(s) to be Solved by the Invention] However, in the quantity of light adjustment of the conventional example, since components increased in number, the actuator which drives the small drawing frame which changes an open condition and a small drawing condition, and a small drawing frame, the wing which carries out shutter actuation, the actuator which drives the wing had the defect that the whole equipment became large.

[0004] Moreover, if the diameter of a opening of a small drawing frame is made smaller than a certain fixed magnitude, since deterioration of optical-character ability (resolution) will be produced by the diffraction phenomena of light, the minimum value of the diameter of a opening is restricted. For this reason, only by the receipts-and-payments change of a small drawing frame, there was also a defect that sufficient quantity of light accommodation could not be performed.

[0005] Then, this invention aims at realizing a compact and the quantity of light adjustment in which sufficient quantity of light accommodation is possible.

[0006]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, a quantity of light adjustment of the invention in this application A protection-from-light member which moves from an open condition before a closing condition, and performs at least one side among continuous quantity of light accommodation and shutter actuation, The 1st actuator which drives this protection-from-light member, and a quantity of light limit member in which a opening of an area smaller than opening area in an open condition of a protection-from-light member was formed, It is attached at least in one side of the 2nd actuator which drives this quantity of light limit member, and a quantity of light limit member and a protection-from-light member, and a opening of a quantity of light limit member is had and constituted in a wrap extinction filter.

[0007] While being able to perform continuous quantity of light accommodation by this, without [without it makes components mark increase, and] causing enlargement of equipment, aggravation of optical-character ability in the small limit quantity of light can be prevented.

[0008] In addition, if an extinction filter is attached in both sides of a quantity of light limit member and a protection-from-light member, compared with a case where an extinction filter is attached only in one side, a thing in the small quantity of light for which one more step of quantity of light accommodation is performed at least will become possible.

[0009] Moreover, when attaching the above-mentioned quantity of light adjustment in a lens attachment

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component in a lens barrel, while arranging a protection-from-light member and a quantity of light limit member in the photographic subject side edge section in a lens attachment component. The 1st actuator and the 2nd actuator are arranged to an image formation side side rather than a protection-from-light member and a quantity of light limit member. By furthermore arranging the 1st actuator and said 2nd actuator in a range in which a lens migration device is not arranged in optical-axis directional vision, a space in a lens-barrel is used effectively and it becomes possible to prevent enlargement of a lens-barrel.

[0010]

[Embodiment of the Invention] Drawing and shutter equipment (quantity of light adjustment) which is the operation gestalt of this invention are shown in drawing 1 - drawing 6.

[0011] Drawing 6 (a) is a cross section of a zoom lens lens-barrel where drawing and shutter equipment are incorporated first. In addition, this zoom lens lens-barrel is used for the photography equipment in which animation photography and still picture photography are possible.

[0012] The plane glass with which 1 was fixed to the anterior part lens-barrel, and 2 was fixed to the front end of the anterior part lens-barrel 1 in this drawing, 1 group optical system of 3 ** and 4 hold 1 group optical system 3. One group displacement frame movable in the direction of an optical axis, 5 holds the drawing shutter equipment of this operation gestalt, and 2 group optical system of 6 **, and 7 holds 2 group optical axis. Two group displacement frames movable in the direction of an optical axis, 3 group optical system by which 8 was held at the back end section of the posterior part lens-barrel 9, They are a guide bar which prevents rotation of these migration frames 4 and 7 while the posterior part lens-barrel by which 9 was connected to the back end section of the anterior part lens-barrel 1, and 10 and 11 guide one group and 2 group-displacement frames 4 and 7 in the direction of an optical axis.

[0013] It was fixed to the anterior part lens-barrel 1, and plane glass 2 has protected movable internal components. 1 group optical system 3 is a focusing glass for carrying out focus adjustment, and is attached in 1 group displacement frame 4. Sleeve section 4a of 1 group displacement frame 4 and U slot 4b have fitted in possible [an optical axis and a parallel displacement] to guide bars 10 and 11. This 1 group-displacement frame 4 is driven in the direction of an optical axis by non-illustrated driving means (step motor etc.). Drawing shutter equipment 5 is located just before 2 group optical system 6, and is being fixed to 2 group displacement frames 7 on the screw etc. 2 group optical system 6 is a zoom MINGU lens for variable power, and sleeve section 7a of 2 group displacement frames 7 and U slot 7b have fitted in possible [an optical axis and a parallel displacement] to guide bars 11 and 10. This 2 group-displacement frame is extracted by the non-illustrated driving means (for example, step motor which has the leading screw which engages with 2 group displacement frames 7 as an output shaft), and is driven in the direction of an optical axis with shutter equipment 5. 3 group optical system 8 is being fixed to the posterior part lens-barrel 9.

[0014] In addition, drawing 6 (a) shows the condition that a focal distance is wide, and it is separated from it of 1 group displacement frame 4 and 2 group displacement frames 7 in this condition.

[0015] Drawing 6 (b) shows the condition of a call of a focal distance, and 1 group displacement frame 4 and 2 group displacement frames 7 are close.

[0016] The graph shown in drawing 6 (c) expresses the motion of 1 group displacement frame 4 at the time of zoom actuation and 2 group displacement frames 7, and if zoom actuation of changing a focal distance to a wide - call is performed, 1 group displacement frame 4 and 2 group displacement frames 7 will move in the direction of an optical axis along with guide bars 10 and 11, respectively so that a top may be traced. Consequently, the focal distance in this zoom lens lens-barrel changes.

[0017] Here, consideration of that 1 group displacement frame 4 and 2 group displacement frames 7 move like drawing 6 (a) and drawing 6 (b) considers that the space between 2 group optical system 6 and 3 group optical system 8 is the most effective as an arrangement space of the direction of an actuator optical axis which drives above-mentioned drawing and shutter equipment 5. Therefore, the actuator of drawing and shutter equipment 5 should be arranged to the image formation side side rather than the location of a small drawing frame and a shutter (drawing) wing.

[0018] Next, the configuration of the above-mentioned drawing and shutter equipment 5 is shown in drawing 1 - drawing 5. The protection-from-light wing A rockable focusing on shaft 21a by which 21 was prepared in the base and 22 was prepared in the base 21 in these drawings. The protection-from-light wing B rockable focusing on shaft 21b by which 23 was prepared in the base 21. It has a bore opening smaller than 21f of open openings by which 24 was formed in the partition wing and 25 was

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formed in the base 21. As for a small drawing frame (quantity of light limit member) rockable focusing on shaft 21c prepared in the base 21, and 26, a wrap ND filter (extinction filter) and 32 are pressure plates about the circular opening of the small drawing frame 25.

[0019] Furthermore, as for the actuator for wings, and 28, 27 is [the interlocking arm for wings and 29] the interlocking arms 30 for small drawing frames, and the actuator for small drawing frames and 30 are attached in the base 21, respectively.

[0020] Moreover, MEKASUTOPPA 21i in MEKASUTOPPA21h in 21g of holes for carrying out the bis-stop of rail 21d for wing A and rail 21f for wing B e, and drawing and shutter equipment 5 to 2 group lens-barrel 7 and the closing location of a wing A22 and the closing location of a wing B23 is formed in the base 21. 31 is the amount detection sensors of drives of the interlocking arm 28 for wings (hall device etc.).

[0021] The condition of having incorporated only the wing A22 is shown in the base 21 at drawing 1 (a). The condition of having incorporated the wing A22 and the wing B23 is shown in the base 21 at drawing 1 (b), and Wings A and B show the condition of open opening. Moreover, the condition of closing is shown in drawing 1 (c). Shutter actuation of opening closing can be made to perform because the interlocking arm 28 for wings shown intelligibly for drawing 4 moves with the actuator 27 for wings between the both ends of an angle theta. Moreover, since the amount of drives of the interlocking arm 28 for wings is detectable by the amount detection sensor 31 of drives, the shutter actuation from the diameter of a opening smaller than 21f of open openings is also possible. That is, shutter speed is changeable.

[0022] Furthermore, the diameter of a opening can be set as the magnitude of arbitration, and the continuous diameter control of a opening, i.e., the drawing actuation for animations, is possible.

[0023] Drawing 2 (a) shows the condition of having divided further from the assembly condition shown in drawing 1 (b), and having incorporated the wing 24. The batch wing 24 is arranged among both, in order to prevent interference with a movable wing A22 and a movable wing B23, and the movable small drawing frame 25.

[0024] The condition of having incorporated the small drawing frame 25 further is shown in drawing 3 (a) from the assembly condition shown in drawing 2 (a), and the out condition evacuated outside the small drawing frame 25 is 21f of open openings is shown. The small drawing frame 25 shows the wrap Inn condition to drawing 3 (b) for 21f of open openings.

[0025] By moving between both the mechanism edges of the angle delta shown intelligibly for drawing 4, the interlocking arm 30 for small drawing frames makes the small drawing frame 25 rock, and can switch to an out condition and the Inn condition. The circular opening currently formed in the small drawing frame 25 has the diameter of a opening of a degree (for example, it is equivalent to F8) which does not degrade the optical-character ability (resolution) of photography optical system. And ND filter 26 is attached in the small drawing frame 25 so that this whole circular opening may be covered.

[0026] When an arrangement space is considered in consideration of drawing 4, drawing 5, and drawing 6 here by the optical-axis directional vision (arrow head S directional vision) of the actuator of the above-mentioned drawing and shutter equipment 5, It is thought most effective to avoid and arrange the device for migration in the direction of an optical axis of each [guide bars 10 and 11, sleeve section 4a, U slot 4b, sleeve section 7a, U slot 7b, and / that are further called the driving means of the 2nd migration frame 7] migration frames 4 and 7.

[0027] Therefore, if it says by drawing 1, actuators 27 and 29 should be distributed to right and left of the migration device of 1 group optical system 3 allotted to the lens-barrel upper and lower sides and 2 group optical system 6, and should be arranged on the outside of optical-system **** cylinder part part 7c of 2 group displacement frames 7.

[0028] Thereby, while making possible the contiguity condition (tele condition) in the direction of an optical axis of 1 group optical system 3 and 2 group optical system 6, the space in a lens-barrel can be used effectively and miniaturization of the whole lens-barrel can be attained.

[0029] In addition, the 2nd ND filter of F8 nominal diameter is attached in one of the above-mentioned wing A22 and the wings B23, and if receipts and payments into the optical path of the 2nd ND filter are performed in the state of Inn of the small drawing frame 25, quantity of light adjustment with still wider width of face can be performed.

[0030]

[Effect of the Invention] The protection-from-light member which performs at least one side among

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continuous quantity of light accommodation and shutter actuation according to this invention as explained above, The 1st actuator which drives this protection-from-light member, and the quantity of light limit member in which the opening of an area smaller than the opening area in the open condition of a protection-from-light member was formed, Since a wrap extinction filter is prepared for the opening of the quantity of light limit member attached at least in one side of the 2nd actuator which drives this quantity of light limit member, and a quantity of light limit member and a protection-from-light member and the quantity of light adjustment is constituted While being able to perform continuous quantity of light accommodation and shutter actuation, without [without it makes components mark increase, and] causing enlargement of equipment The quantity of light adjustment which can respond to the both sides of the animation photography which can prevent aggravation of the optical-character ability in the small limit quantity of light, and still picture photography is realizable.

[0031] In addition, if an extinction filter is attached in the both sides of a quantity of light limit member and a protection-from-light member, compared with the case where an extinction filter is attached only in one side, one step of quantity of light accommodation in the small quantity of light which will be rubbed if few can be performed.

[0032] Moreover, when attaching the above-mentioned quantity of light adjustment in the lens attachment component in a lens barrel, while arranging a protection-from-light member and a quantity of light limit member in the photographic subject side edge section in a lens attachment component The 1st actuator and the 2nd actuator are arranged to an image formation side side rather than a protection-from-light member and a quantity of light limit member. If the 1st actuator and said 2nd actuator are furthermore arranged in the range in which the lens migration device is not arranged in optical-axis directional vision, the space in a lens-barrel can be used effectively and enlargement of a lens-barrel can be prevented.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The assembly and actuation explanatory drawing of drawing and shutter equipment which are the operation gestalt of this invention.

[Drawing 2] The assembly and actuation explanatory drawing of the above-mentioned drawing and shutter equipment.

[Drawing 3] The assembly and actuation explanatory drawing of the above-mentioned drawing and shutter equipment.

[Drawing 4] The base of the above-mentioned drawing and shutter equipment, and explanatory drawing of an actuator.

[Drawing 5] The partial enlarged view of the lens barrel incorporating the above-mentioned drawing and shutter equipment.

[Drawing 6] Above-mentioned whole lens barrel cross section and actuation explanatory drawing.

[Description of Notations]

- 1 -- Anterior part lens-barrel
- 2 -- Plane glass
- 3 -- 1 group optical system
- 4 -- One group displacement frame
- 5 -- Drawing and shutter equipment
- 6 -- 2 group optical system
- 7 -- Two group displacement frames
- 8 -- 3 group optical system
- 9 -- Posterior part lens-barrel
- 10 11 -- Guide bar
- 21 -- Base
- 22 -- Wing A
- 23 -- Wing B
- 24 -- Partition wing
- 25 -- Smallness drawing frame
- 26 -- ND filter
- 27 -- Actuator for wings
- 28 -- Interlocking arm for wings
- 29 -- Actuator for smallness drawing frames
- 30 -- Interlocking arm for smallness drawing frames
- 31 -- The amount detection sensor of drives
- 32 -- Pressure plate

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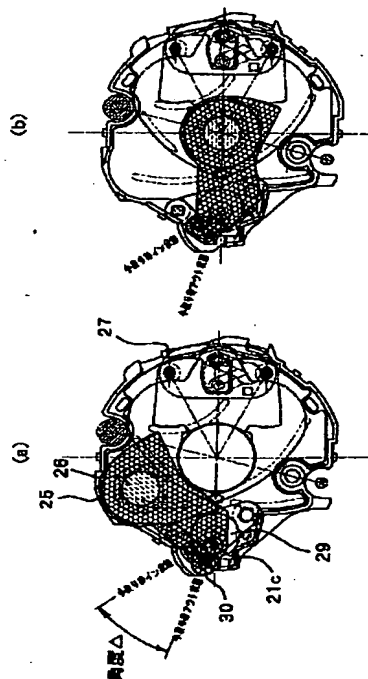
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(54)【発明の名称】 光量調節装置、レンズ鏡筒および撮影装置

(57)【要約】

【課題】 連続的な光量調節を行うとともに小絞り状態を設定できる光量調節装置は、部品点数が多く、光学性能の悪化させずに設定できる小絞り径に制限がある。

【解決手段】 開放状態から閉じ状態までの間で移動して、連続的な光量調節およびシャッター動作のうち少なくとも一方を行う遮光部材22、23と、この遮光部材を駆動する第1アクチュエータ27と、遮光部材の開放状態での開口面積よりも小さな面積の開口が形成された光量制限部材25と、この光量制限部材を駆動する第2アクチュエータ29と、光量制限部材および遮光部材の少なくとも一方に取り付けられ、光量制限部材の開口を覆う減光フィルター26とを有して光量調節装置を構成する。



【特許請求の範囲】

【請求項1】 開放状態から閉じ状態までの間で移動して、連続的な光量調節およびシャッター動作のうち少なくとも一方を行う遮光部材と、

この遮光部材を駆動する第1アクチュエータと、
前記遮光部材の開放状態での開口面積よりも小さな面積の開口が形成された光量制限部材と、

この光量制限部材を駆動する第2アクチュエータと、
前記遮光部材および前記小光量制限部材のうち少なくとも一方に取り付けられ、前記光量制限部材の開口を覆う減光フィルターとを有して構成されることを特徴とする光量調節装置。

【請求項2】 前記遮光部材の移動状態を検出するための検出手段を有することを特徴とする請求項1に記載の光量調節装置。

【請求項3】 請求項1又は2に記載の光量調節装置を備えたことを特徴とするレンズ鏡筒。

【請求項4】 光軸方向に移動可能なレンズ保持部材を有しており、

前記光量調節装置を前記レンズ保持部材に取り付けたことを特徴とする請求項3に記載のレンズ鏡筒。

【請求項5】 前記遮光部材および前記小光量制限部材を前記レンズ保持部材における被写体側端部に配置し、前記第1アクチュエータと前記第2アクチュエータとを、前記遮光部材および前記小光量制限部材よりも結像面側に配置したことを特徴とする請求項4に記載のレンズ鏡筒。

【請求項6】 レンズを光軸方向に移動させるための機構を有しており、

前記第1アクチュエータおよび前記第2アクチュエータを、光軸方向視において前記移動機構が配置されていない範囲に配置したことを特徴とする請求項4又は5に記載のレンズ鏡筒。

【請求項7】 前記第1アクチュエータおよび前記第2アクチュエータを、前記レンズ保持部材におけるレンズが取り付けられる筒状部分の外側に配置したことを特徴とする請求項5又は6に記載のレンズ鏡筒。

【請求項8】 請求項3から7のいずれかに記載のレンズ鏡筒を備えたことを特徴とする撮影装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、カメラ、ビデオカメラ、デジタルスチルカメラ等の撮影装置に用いられるレンズ鏡筒内に配置される光量調節装置に関するものである。

【0002】

【従来の技術】ビデオカメラ等の動画撮影カメラには、絞りを開放状態から全閉状態まで連続的に変化させることができる動画用光量調節装置が用いられる。一方、デジタルスチルカメラ等の静止画撮影カメラには、開放状

態と小絞り状態（例えば、F8）の2ポジション切り替えを行え、さらにシャッター動作も可能な静止画用光量調節装置が用いられることがある。

【0003】

【発明が解決しようとする課題】しかしながら、従来例の光量調節装置では、開放状態と小絞り状態を切り替える小絞り枠、小絞り枠を駆動するアクチュエータ、シャッター動作をする羽根、その羽根を駆動するアクチュエータ等、構成要素が多くなるため、装置全体が大きくなるという欠点があった。

【0004】また、小絞り枠の開口径をある一定の大きさより小さくすると、光の回折現象によって光学性能（解像力）の劣化を生じるため、開口径の最小値が制限される。このため小絞り枠の出し入れ切替えだけでは、十分な光量調節ができないという欠点もあった。

【0005】そこで、本発明は、コンパクト且つ十分な光量調節が可能な光量調節装置を実現することを目的としている。

【0006】

【課題を解決するための手段】上記目的を達成するため、本願発明の光量調節装置は、開放状態から閉じ状態までの間で移動して、連続的な光量調節およびシャッター動作のうち少なくとも一方を行う遮光部材と、この遮光部材を駆動する第1アクチュエータと、遮光部材の開放状態での開口面積よりも小さな面積の開口が形成された光量制限部材と、この光量制限部材を駆動する第2アクチュエータと、光量制限部材および遮光部材の少なくとも一方に取り付けられ、光量制限部材の開口を覆う減光フィルターとを有して構成されている。

【0007】これにより、部品点数を増加させることなく、かつ装置の大型化を招くことなく、連続的な光量調節を行えとともに、小さな制限光量での光学性能の悪化を防止することができる。

【0008】なお、光量制限部材および遮光部材の双方に減光フィルターを取り付ければ、一方のみに減光フィルターを取り付ける場合に比べて、小光量における少なくとももう一段の光量調節を行うことが可能となる。

【0009】また、上記光量調節装置をレンズ鏡筒内のレンズ保持部材に取り付ける場合に、遮光部材および光量制限部材をレンズ保持部材における被写体側端部に配置するとともに、第1アクチュエータと第2アクチュエータとを、遮光部材および光量制限部材よりも結像面側に配置し、さらに第1アクチュエータおよび前記第2アクチュエータを、光軸方向視においてレンズ移動機構が配置されていない範囲に配置することにより、鏡筒内スペースを有効利用して、鏡筒の大型化を防止することが可能となる。

【0010】

【発明の実施の形態】図1～図6には、本発明の実施形態である絞り・シャッター装置（光量調節装置）を示し

ている。

【0011】まず図6(a)は、絞り・シャッター装置が組込まれるズームレンズ鏡筒の断面図である。なお、このズームレンズ鏡筒は、動画撮影および静止画撮影が可能な撮影装置に用いられる。

【0012】この図において、1は前部鏡筒、2は前部鏡筒1の前端に固定された平面ガラス、3はの1群光学系、4は1群光学系3を保持し、光軸方向に移動可能な1群移動枠、5は本実施形態の絞りシャッター装置、6はの2群光学系、7は2群光学系を保持し、光軸方向に移動可能な2群移動枠、8は後部鏡筒9の後端部に保持された3群光学系、9は前部鏡筒1の後端部に接続された後部鏡筒、10、11は1群および2群移動枠4、7を光軸方向にガイドするとともにこれら移動枠4、7の回転を防止するガイドバーである。

【0013】平面ガラス2は、前部鏡筒1に固定され、可動の内部部品を保護している。1群光学系3は、ピント調整するためのフォーカシングレンズであり、1群移動枠4に取付けられている。1群移動枠4のスリーブ部4aとU溝部4bは、ガイドバー10、11に対し、光軸と平行移動可能に嵌合している。この1群移動枠4は、不図示の駆動手段(ステップモーター等)により光軸方向に駆動される。絞りシャッター装置5は、2群光学系6の直前に位置し、ビス等により2群移動枠7に固定されている。2群光学系6は、変倍のためのズームミングレンズで、2群移動枠7のスリーブ部7aとU溝部7bは、ガイドバー11、10に対し、光軸と平行移動可能に嵌合している。この2群移動枠は、不図示の駆動手段(例えば、2群移動枠7に係合するリードスクリュウを出力軸として有するステップモーター)により絞りシャッター装置5と共に光軸方向に駆動される。3群光学系8は、後部鏡筒9に固定されている。

【0014】なお、図6(a)は、焦点距離がワイドの状態を示しており、この状態では、1群移動枠4と2群移動枠7は離れている。

【0015】図6(b)は、焦点距離がテレの状態を示しており、1群移動枠4と2群移動枠7は近接している。

【0016】図6(c)に示したグラフは、ズーム操作時の1群移動枠4と2群移動枠7の動きを表わしており、焦点距離をワイド～テレへと変化させるズーム操作を行うと、1群移動枠4と2群移動枠7はそれぞれ、上をトレースするようにガイドバー10、11に沿って光軸方向に移動する。その結果、本ズームレンズ鏡筒における焦点距離が変化する。

【0017】ここで、図6(a)、図6(b)のように1群移動枠4と2群移動枠7が移動することを考慮すると、上記絞り・シャッター装置5を駆動するアクチュエータ光軸方向の配置スペースとしては、2群光学系6と3群光学系8の間の空間が最も有効と考えられる。従っ

て、絞り・シャッター装置5のアクチュエータは、小絞り枠とシャッター(絞り)羽根の位置よりも結像面側に配置すべきである。

【0018】次に、図1～図5に上記絞り・シャッター装置5の構成を示す。これらの図において、21はベース、22はベース21に設けられた軸21aを中心に揺動可能な遮光羽根A、23はベース21に設けられた軸21bを中心に揺動可能な遮光羽根B、24は仕切り羽根、25はベース21に形成された開放開口21fよりも小さな内径開口を有し、ベース21に設けられた軸21cを中心に揺動可能な小絞り枠(光量制限部材)、26は小絞り枠25の円形開口を覆うNDフィルター(減光フィルター)、32は押え板である。

【0019】さらに、27は羽根用アクチュエータ、28は羽根用連動アーム、29は、小絞り枠用アクチュエータ、30は小絞り枠用連動アーム30であり、それぞれベース21に取り付けられている。

【0020】また、ベース21には羽根A用レール21d、羽根B用レール21e、絞り・シャッター装置5を2群鏡筒7にビス止めするための穴21g、羽根A22のクローズ位置でのメカストッパー21h、羽根B23のクローズ位置でのメカストッパー21iが形成されている。31は羽根用連動アーム28の駆動量検知センサ(ホール素子等)である。

【0021】図1(a)には、ベース21に羽根A22のみを組み込んだ状態を示している。図1(b)には、ベース21に羽根A22と羽根B23を組み込んだ状態を示しており、羽根A、Bが開放オープンの状態を示している。また、図1(c)には、クローズの状態を示している。羽根用アクチュエータ27によって、図4に分かりやすく示した羽根用連動アーム28が角度 θ の両端間を動くことで、オープン・クローズのシャッター動作を行わせることができる。また、羽根用連動アーム28の駆動量は駆動量検知センサ31によって検知することができるので、開放開口21fより小さい開口径からのシャッター動作も可能である。つまり、シャッタースピードを変えることができる。

【0022】さらに、開口径を任意の大きさに設定することができ、連続的な開口径制御すなわち、動画用絞り動作が可能である。

【0023】図2(a)は、図1(b)に示した組立状態からさらに仕切り羽根24を組み込んだ状態を示している。仕切り羽根24は、可動の羽根A22および羽根B23と可動の小絞り枠25との干渉を防ぐために両者の間に配置されるものである。

【0024】図3(a)には、図2(a)に示す組立状態からさらに小絞り枠25を組み込んだ状態を示しており、小絞り枠25が開放開口21fの外に退避するアウト状態を示している。図3(b)には、小絞り枠25が開放開口21fを覆うイン状態を示している。

【0025】小絞り枠用連動アーム30が、図4に分かりやすく示した角度 Δ の両メカ端間を動くことで、小絞り枠25を揺動させ、アウト状態とイン状態とに切り換えることができる。小絞り枠25に形成されている円形開口は、撮影光学系の光学性能（解像力）を劣化させない（例えば、F8に相当する）程度の開口径を有する。そして、この円形開口全体を覆うようにNDフィルター26が小絞り枠25に取り付けられている。

【0026】ここで図4、図5、図6を考慮し、上記絞り・シャッター装置5のアクチュエータの光軸方向視（矢印S方向視）で配置スペースを考えた場合、ガイドバー10、11、スリーブ部4a、U溝部4b、スリーブ部7a、U溝部7b、さらには第2移動枠7の駆動手段といった各移動枠4、7の光軸方向への移動のための機構を避けて配置することが最も有効と考えられる。

【0027】従って、アクチュエータ27、29は、図1でいえば鏡筒上下に配された1群光学系3と2群光学系6の移動機構の左右に振り分けて、2群移動枠7の光学系保部筒部分7cの外側に配置すべきである。

【0028】これにより、1群光学系3と2群光学系6との光軸方向における近接状態（テレ状態）を可能とするとともに、鏡筒内のスペースを有効利用して鏡筒全体のコンパクト化を図ることができる。

【0029】なお、前述の羽根A22、羽根B23のどちらかに、F8相当径の第2のNDフィルターを取り付けておき、小絞り枠25のイン状態で、第2のNDフィルターの光路内への出し入れを行えば、さらに幅の広い光量調整ができる。

【0030】

【発明の効果】以上説明したように、本発明によれば、連続的な光量調節およびシャッター動作のうち少なくとも一方を行う遮光部材と、この遮光部材を駆動する第1アクチュエータと、遮光部材の開放状態での開口面積よりも小さな面積の開口が形成された光量制限部材と、この光量制限部材を駆動する第2アクチュエータと、光量制限部材および遮光部材の少なくとも一方に取り付けられた、光量制限部材の開口を覆う減光フィルターとを設けて光量調節装置を構成しているのので、部品点数を増加させることなく、かつ装置の大型化を招くことなく、連続的な光量調節やシャッター動作を行えるとともに、小さな制限光量での光学性能の悪化を防止することができる、動画撮影および静止画撮影の双方に対応可能な光量調節装置を実現することができる。

【0031】なお、光量制限部材および遮光部材の双方に減光フィルターを取り付けられれば、一方のみに減光フィルターを取り付ける場合に比べて、小光量における少な

くとももう一段の光量調節を行うことができる。

【0032】また、上記光量調節装置をレンズ鏡筒内のレンズ保持部材に取り付ける場合に、遮光部材および光量制限部材をレンズ保持部材における被写体側端部に配置するとともに、第1アクチュエータと第2アクチュエータとを、遮光部材および光量制限部材よりも結像面側に配置し、さらに第1アクチュエータおよび前記第2アクチュエータを、光軸方向視においてレンズ移動機構が配置されていない範囲に配置すれば、鏡筒内スペースを有効利用して、鏡筒の大型化を防止することができる。

【図面の簡単な説明】

【図1】本発明の実施形態である絞り・シャッター装置の組立ておよび作動説明図。

【図2】上記絞り・シャッター装置の組立ておよび作動説明図。

【図3】上記絞り・シャッター装置の組立ておよび作動説明図。

【図4】上記絞り・シャッター装置のベースおよびアクチュエータの説明図。

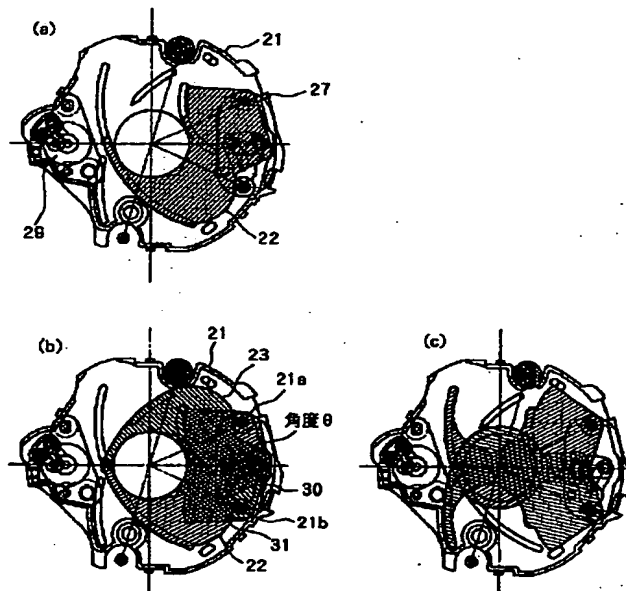
【図5】上記絞り・シャッター装置を組み込んだレンズ鏡筒の部分拡大図。

【図6】上記レンズ鏡筒の全体断面図および作動説明図。

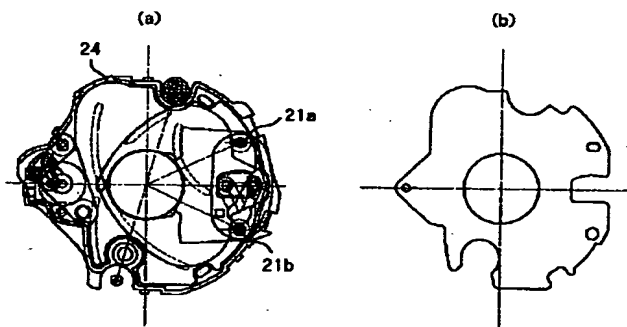
【符号の説明】

- 1…前部鏡筒
- 2…平面ガラス
- 3…1群光学系
- 4…1群移動枠
- 5…絞り・シャッター装置
- 6…2群光学系
- 7…2群移動枠
- 8…3群光学系
- 9…後部鏡筒
- 10、11…ガイドバー
- 21…ベース
- 22…羽根A
- 23…羽根B
- 24…仕切り羽根
- 25…小絞り枠
- 26…NDフィルター
- 27…羽根用アクチュエータ
- 28…羽根用連動アーム
- 29…小絞り枠用アクチュエータ
- 30…小絞り枠用連動アーム
- 31…駆動量検知センサ
- 32…押え板

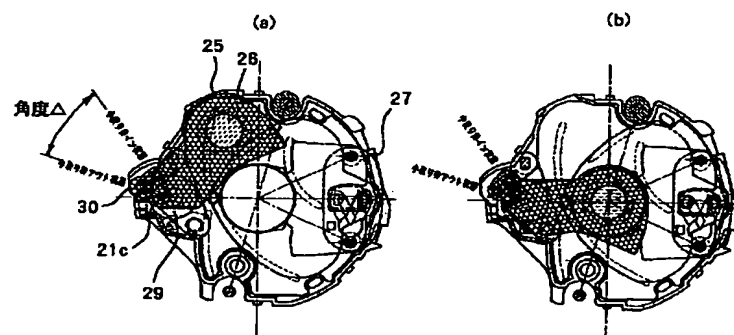
【図 1】



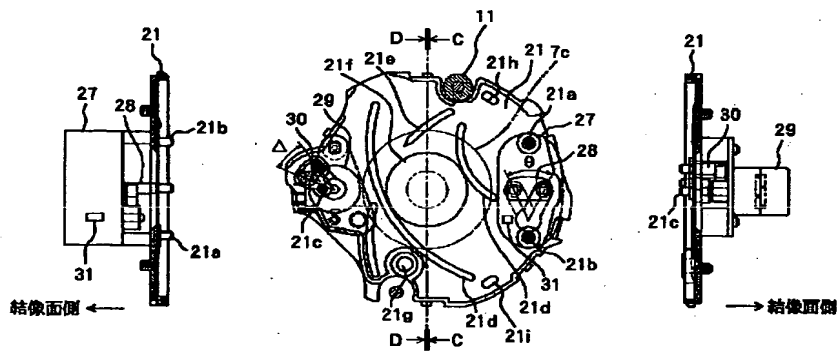
【図 2】



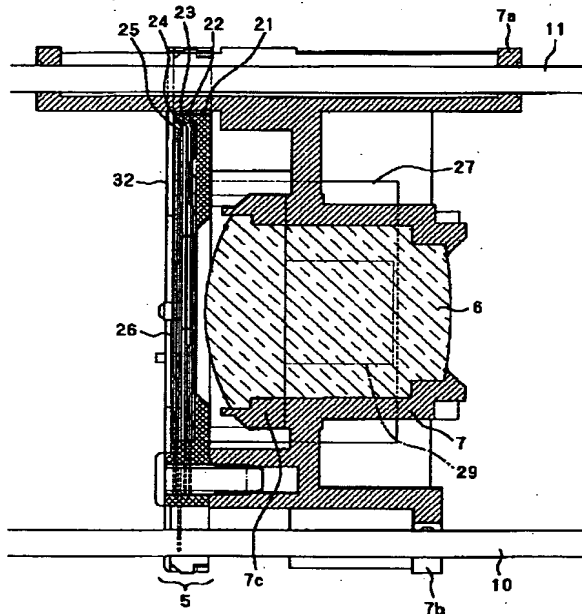
【図 3】



【図4】



【図5】



【図6】

